FROM GPS to GIS: Getting your field GPS data into ArcMap

GPS data can be downloaded from the field collection unit in a number into a number of file types. These instructions assume that you have a DBF table that contains X &Y coordinates for each location.

GPS units can output these X & Y coordinates in many different coordinate systems. You will need to know which system your data was collected in as well as the datum used by the GPS unit. Many high-quality GPS units will collect information in the Washington State Plane North coordinate system with a HPGN/HARN datum. Because this is the King County standard for GIS data, if your data was collected in this format, you will only need to follow the steps in *Part I: Turning GPS Table Data into Mappable GIS Data* to be able to plot this data with King County GIS data.

If your information was collected in latitude & longitude, though, you will need additionally follow the steps in *Part II: Projecting Your GIS Data* to be able to use it with King County GIS Data. This guide will assume your latitude, longitude data is in decimal degrees (DD) instead of degrees, minutes, and seconds (DMS). To convert your DMS data to DD use this formula:

$$DD = degrees + minutes/60 + seconds/3600$$

Be careful! Some GPS units report in degrees, minutes. That is, instead of a string of numbers like 47 18 11.46, you will get 47 18.190. To convert these, you would use $DD = degrees + minutes/60$. Also remember that longitude should be recorded as a negative number after you make the calculation.

Part I: Turning GPS Table Data into Mappable GIS Data

1) The first thing you need to do is to check that your X & Y coordinate data is in a number format. To check what format your data is in, start ArcCatalog, navigate to the table and right click on it. Choose "Properties" from the context menu. In the Table Properties dialogue, choose the "Fields" tab, and make sure the Data Type for your X & Y coordinate fields are "Double" or "Float".

2) If your Data Types are "Text", follow the next steps to fix this, otherwise go on to step 3.
   a. In the same dialogue as shown above, create new columns by typing in new names in an open row of the "Field Name" and setting the other parameters as shown above and then clicking the "OK" button at the bottom. The precision describes the number of digits that can be stored in the field, while the scale describes the number of decimal places for float and double fields.
   b. Then close ArcCatalog, start up ArcMap and add the table to your ArcMap project.
   c. Right click on the table in the Layer list and choose "Open" from the context menu.
   d. When the table opens, right click on one of the new columns and choose "Calculate Values" from the context menu. Say "Yes" to the message asking you if you want to continue outside an edit session.
   e. Type in VAL ([ColumnName]) as shown below. The ColumnName is the column that has the Text version of the Latitude or Longitude data that you want to convert to a number. Then click the "OK" button.
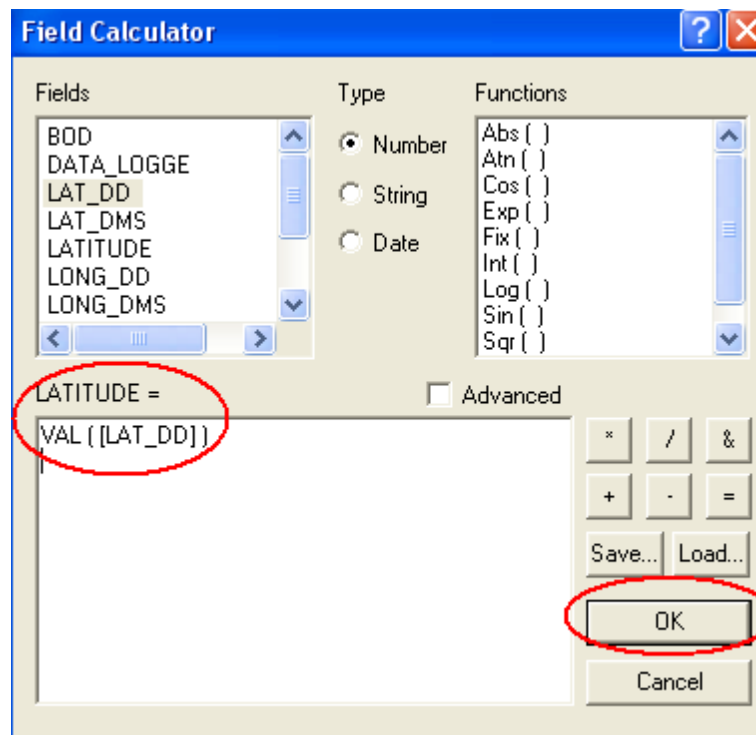
   f. Repeat step 2e with the other latitude or longitude columns, and then close the table.

3) If you skipped Step 2, start a new session of ArcMap, otherwise just continue in the same session as in Step 2. From the Tools menu, choose "Add XY data", select your table and set your X & Y coordinate fields. Then click the "Edit" button.
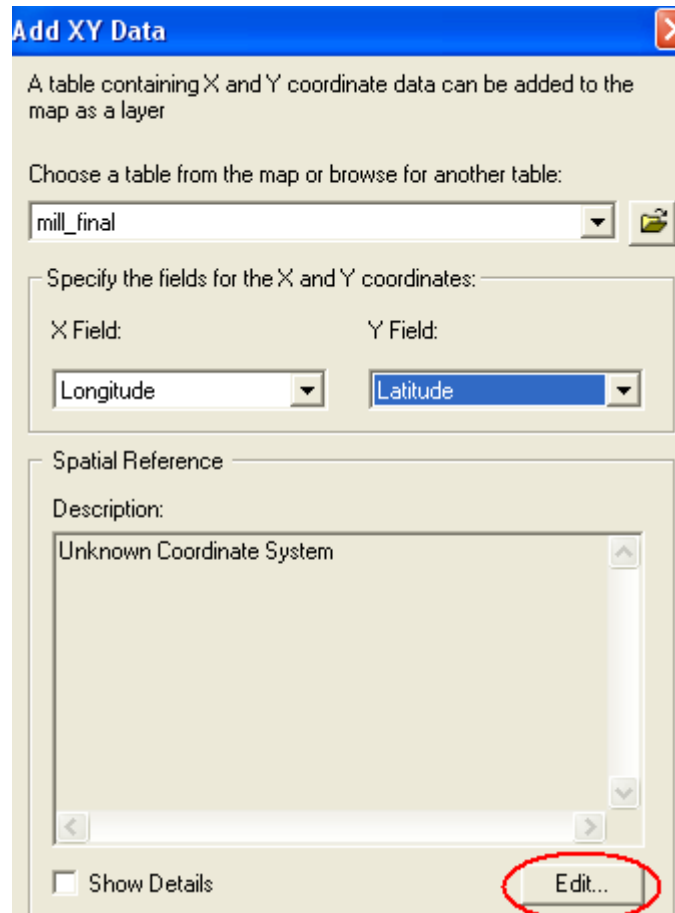
4) To complete the next step, you will do one of 2 actions:
   a. *If your data was collected in Washington State Plane North, datum HPGN (also called HARN):* In the "Spatial Reference Properties" dialogue box that appears, click the "Import" button. Navigate to any SHAPEFILE on DNRPLIB, and select it by highlighting it and clicking the "Add" button. This adds the already defined projection information (contained in the *.prj file you see when browsing in Windows Explorer) from that shapefile. You could also have hit the "Select" button and navigated to the "Projected Coordinate Systems\State Plane" to pick out the appropriate reference, but importing the information from another shapefile is a useful shortcut.
   b. *If your data was collected in the geographic coordinate system (i.e. latitude & longitude):* In the "Spatial Reference Properties" dialogue box that appears, click the "Select" button. You will need to know what datum your GPS data was collected in to make a selection here. Often, the default for geographic coordinate system GPS data is WGS84. If it is WGS84, navigate to "Geographic Coordinate Systems\World" folder and select this datum reference by highlighting it and clicking the "Add" button.
5) Once you've added the spatial coordinate system reference, you can click the "OK" button to close the "Spatial Reference Properties" dialogue box and get back to the "Add XY

Data" dialogue box shown in Step 3. The spatial reference you just selected should now appear in the "Description" box.

6) Click the "OK" button, and your new dataset is created and added to the Layer list as [TableName] Events. You now have created a layer reference to your original table of GPS data that displays the data *within the current project*. However, to permanently save this information for use in other projects, you need to export it as a shapefile or geodatabase.

7) Right click on the "[TableName] Events" and from the context menu choose "Data" and then "Export Data". Make sure the dialogue box is filled out as below (except data path & name are whatever you want – don't forget to make a note of where this is!).
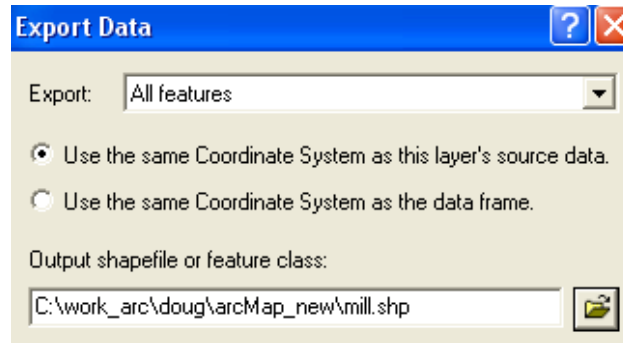
8) When asked, you don't need to add the new dataset to your ArcMap session unless you'd like to start using it immediately.

At this point, you have at succeeded in creating a new GIS dataset from your GPS data file. If your data was collected in Washington State Plane North coordinate system, you now are done!

Otherwise, if your data was collected in a geographic coordinate system (latitude & longitude), you will need to follow the *Part II: Projecting Your GIS Data* steps in order to map your data with other King County GIS data.

Part II: Projecting Your GIS Data

1) Open ArcToolbox. Expand "Data Management Tools" and then expand "Projections". Double click on the "Projection Wizard (shapefiles, geodatabases)". When the wizard launches, select the dataset you just exported and then click the "Next" button.

2) Type in an output location and name for the projected dataset you will be creating and click the "Next" button.

3) Click the "Select Coordinate System" button. In the "Spatial Reference Properties" dialogue box that appears, click the "Import" button. Navigate to any SHAPEFILE on DNRPLIB, and select it by highlighting it and clicking the "Add" button. This adds the already defined projection information (contained in the *.prj file you see when browsing in Windows Explorer) from that shapefile. You could also have hit the "Select" button and navigated to the "Projected Coordinate Systems\State Plane" to pick out the appropriate reference, but importing the information from another shapefile is a useful shortcut.

4) Once you've added the spatial coordinate system reference, you can click the "OK" button to close the "Spatial Reference Properties" dialogue box and get back to the Project

Wizard. The spatial reference you just selected should now appear in the "Details" box. Click the "Next" button.

5) The Project Wizard will show a frowny face as shown below because your data's datum is different than the King County standard you just imported in step 3. To solve this problem, click the "Set Transformation" button.
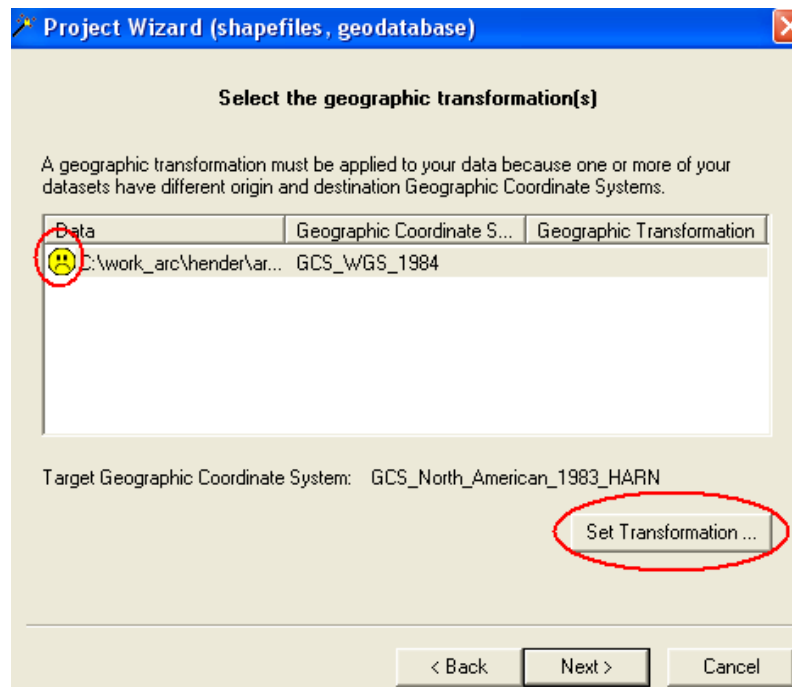
6) The "Geographic Coordinate System Transformations" dialogue box opens. You can accept the defaults (they should look like that shown below), by clicking the "OK" button. Your frowny face should turn to a smiley face.
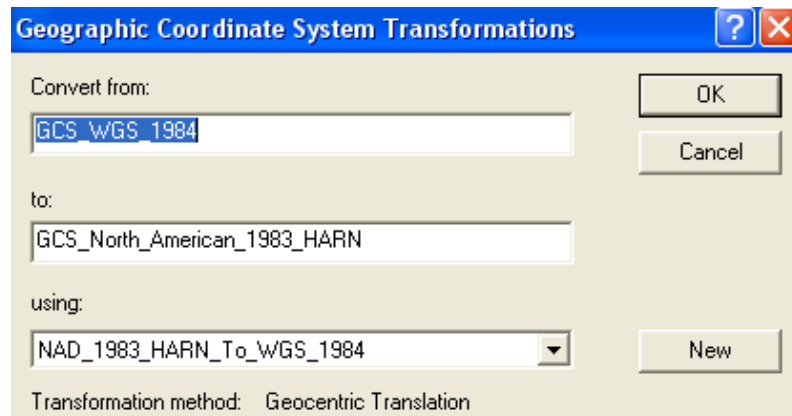
7) Click the "Next" button 2 more times and then finally the "Finish" button. ArcMap makes the conversion and the Project Wizard exits. Now you can close ArcToolbox.

YIPPEE! You are finally done! Yes, you can now add this data to your ArcMap project and it will (hopefully!) map right where it should in relation to other King County GIS data. Keep in mind, though, that most GPS data is much more accurate than GIS data in general, so your points may not completely match up with other non-GPS derived GIS data. However, large discrepancies indicate some sort of problem with your data – wrong GPS datum, incorrect conversion to decimal degrees, etc.